

Psoroglaena halmaturina sp. nov. (lichenised Ascomycota, Verrucariaceae) from Kangaroo Island, South Australia

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Abstract

A new lichen species, *Psoroglaena halmaturina* P.M. McCarthy & Kantvilas (Verrucariaceae), is described from the bark of trees in remnant mallee and *Melaleuca* thicket on Kangaroo Island, South Australia. The generic affinities of the species are discussed and a key to the Australian species of *Psoroglaena*, and the related genera *Agonimia* and *Phylloblastia*, is provided.

Keywords: *Agonimia*, biodiversity, lichens, key, new species, *Phylloblastia*, taxonomy.

Introduction

The Verrucariaceae, one of the most species-rich families of lichenised fungi (including at least 700 taxa, with more than 80 currently known from Australia), is predominantly temperate in its geographical range, saxicolous in its substratum preference and is dominated by crustose taxa with a green photobiont, mainly black perithecioid ascomata, fissitunicate asci and a hamathecium of periphyses. While attempts to refine generic circumscriptions and resolve their relationships using molecular phylogenetic analyses (e.g. Gueidan *et al.* 2009; Muggia *et al.* 2010; Guzow-Krzemińska *et al.* 2012) have been informative, generic placement often remains problematic, as exemplified by our investigation of corticolous specimens recently collected on Kangaroo Island, South Australia.

These specimens have an inconspicuous, greenish, granulose to minutely squamulose thallus and blackish non-involucrellate ascomata that outwardly resemble the mainly northern-temperate to boreal genus *Agonimia* Zahlbr. However, all species of *Agonimia*, which is represented in Australia by *A. tristicula* (Nyl.) Zahlbr. and *A. opuntiella* (Buschardt & Poelt) Vězda, have ellipsoidal ascospores with muriform septation (McCarthy 2001a; Aptroot 2011). By contrast, the oblong-fusiform and persistently trans-septate ascospores of the South Australian material, in combination with other thalline and ascomatal characters, place it within the currently broad circumscription of *Psoroglaena* Müll.Arg.

Fourteen species of *Psoroglaena* occur mainly on the bark and leaves of trees (less commonly on rock and bryophytes) in temperate, subtropical and tropical regions of the world. They share the following combination of characters: 1) a filamentous, squamulose,

granulose or crustose thallus; 2) mycobiont hyphae that are usually papillose; 3) pale yellowish, pale brown, brownish grey or blackish perithecia that either lack or have a reduced involucrellum; and 4) colourless, transversely septate to muriform and fusiform-ellipsoidal to oblong-fusiform ascospores (Harada 2003; Lücking, 2008). The genus is already represented in Australia by the type species, the corticolous *P. cubensis* Müll.Arg., and the foliicolous *P. perminuta* (Vězda) H.Harada, both pale-fruited taxa known from eastern Queensland (McCarthy 2012). Furthermore, some species of *Phylloblastia* Vain., another mainly tropical and foliicolous genus, must be regarded as doubtfully distinct from *Psoroglaena* (McCarthy 2001b; Lücking 2008), being characterised by less-than-satisfactory attributes including comparatively subtle differences in the shape of perithecia and ascospores, and the presence or absence of an involucrellum.

Here, we describe *P. halmaturina*, a new species from Kangaroo Island, South Australia. It is characterised by its corticolous thallus, thalline morphology, the anatomy and dimensions of its blackish perithecia and the size and unique septation of the ascospores. In order to aid the recognition of this and similar taxa, we also provide a combined key to the three Australian species of *Psoroglaena*, the two *Agonimia* taxa, and the seven representatives of *Phylloblastia* (McCarthy 2010, McCarthy & Stajsic, in press).

Psoroglaena halmaturina P.M.McCarthy & Kantvilas, sp. nov.

Thallus corticola, crustosus et irregulariter rugulosus vel granulosus aut minute squamulosus, pallide viridis vel medie griseoviridis, (30–) 50–70 (–100) µm crassus. Algae chlorococcoideae, 4–8 (–12) µm

diametro. Perithecia superficialiter admodum atra, plerumque late ovoidea vel pyriformes, semi-immersa aut prominentia et thallo partim tecto, (0.23–) 0.30 (–0.35) mm diametro. Involucrellum deest. Excipulum in sectione superne fuscoatrum, 40–55 μm crassum, inferne bistratum, 22–30 μm crassum. Paraphyses desunt. Periphyses ramosae-anastomosantes, 40–80 \times 1–1.5 μm . Asci fissitunicati, ellipsoidei vel clavati, 70–85 \times 18–25 μm . Ascospores incolratae, (5–) 7-septatae, oblongatae-fusiformes, (25–) 31 (–36) \times (5.5–) 7 (–9) μm .

Mycobank no.: MB803954.

Holotypus: SOUTH AUSTRALIA. **Kangaroo Island:** Dudley East, Moffatt Road, alt. 70 m, on base of eucalypt trunk in remnant roadside strip of mallee, 30 Sep. 2011, G. Kantvilas 253/11 & B. de Villiers (HO 562831).

Thallus corticolous, crustose, diffuse and \pm smooth to minutely uneven and irregularly rugulose or granulose to minutely squamulose, dull pale green to medium greyish green, (30–) 50–70 (–100) μm thick, ecoriicate or the granules/squamules with an outer 'layer' of 1 or 2 periclinal hyphae; squamules rounded and 0.1–0.4 mm wide, or somewhat elongate and 0.2–0.5 mm long and 0.1–0.3 mm wide, lacking attachment organs, persistent or dissolving into \pm rounded granules 20–50 (–60) μm wide. Photobiont cells green, unicellular, \pm spherical to broadly ellipsoidal, 4–8 (–12) μm wide, occupying \pm the whole thallus or forming clusters of up to c. 100–200 cells; thalline hyphae short-celled, 1.5–2 μm wide, sparingly papillose, the papillae conical or peg-like c. 1–1.5 μm long and 0.5–1 μm wide at the base. Prothallus not apparent. Ascomata perithecia, moderately numerous, solitary, scattered, (0.23–) 0.30 (–0.35) mm diam. [$n = 50$], outwardly dark olive-brown to dull blackish, initially subglobose and at least two-thirds

immersed in the thallus, becoming more prominent, broadly ovoid to broadly pyriform, occasionally short-rostrate below the rounded or somewhat flattened apex; even when prominent the lower half of the ascoma usually retaining a partial or complete thalline collar; ostiole inconspicuous or in a shallow depression 20–30 μm wide. Involucrellum absent. Excipulum 40–55 μm thick and uniformly dark at the apex, 22–30 μm thick and bilayered below; inner layer hyaline to pale brown in thin section, the cells periclinally elongate, thin-walled and closely arranged; outer layer dark olive-brown, greyish black or jet-black, the cells more irregular in shape to \pm isodiametric, comparatively thick-walled. Subhymenium 10–15 μm thick. Paraphyses absent. Periphyses branched and anastomosing, 40–80 \times 1–1.5 μm . Ascoplasma IKI+ red-brown, unchanged after pretreatment with K; hymenial gel and subhymenium IKI–, turning blue-violet when pretreated with K. Asci fissitunicate, 8-spored, broadly ellipsoid or narrowly to broadly clavate, 70–85 \times 18–25 μm [$n = 30$], initially with a distinct tholus and ocular chamber, the latter subsequently broadening and all but disappearing at maturity. Ascospores irregularly or obliquely massed in the ascus, colourless, transversely (5–) 7-septate, oblong-fusiform, straight or slightly curved, with subacute ends, not or only slightly constricted at the septa, (25–) 31 (–36) \times (5.5–) 7 (–9) μm [$n = 140$]; wall c. 0.5–1 μm thick, lacking an epispore; contents minutely granulose and/or guttulate. Pycnidia not seen. **Fig. 1.**

Notes. A broad suite of thalline and ascomatal characters place the new species in *Psoroglaena* while setting it apart from other taxa in that and related genera. Thus, *P. halmaturina* is characterised

Key to the Australian Species of *Psoroglaena*, *Agonimia* and *Phylloblastia*

- 1: Thallus growing on bark, soil or bryophytes
 - 2: Ascospores with (5–) 7 transverse septa only *Psoroglaena halmaturina*
 - 2: Ascospores muriform
 - 3: Ascomata pale orange-brown *Psoroglaena cubensis*
 - 3: Ascomata black
 - 4: Thallus growing on bark; ascospores 40–70 \times 20–30 μm *Agonimia opuntiiella*
 - 4: Thallus growing on soil or bryophytes; ascospores 60–135 \times 30–50 μm *Agonimia tristicula*
- 1: Thallus growing on living leaves
 - 5: Ascospores submuriform
 - 6: Ascospores 32–52 \times 8–13 μm , with 3–11 transverse septa *Phylloblastia bielczykiae*
 - 6: Ascospores 110–180 \times 5–10 μm , with 40–70 transverse septa *Phylloblastia dolichospora*
 - 5: Ascospores with transverse septa only
 - 7: Thallus usually isidiate, often sterile *Phylloblastia borhidii*
 - 7: Thallus lacking isidia, commonly fertile
 - 8: Ascospores 3–6-septate
 - 9: Ascospores persistently 3-septate *Psoroglaena perminuta*
[possible syn: *Phylloblastia triseptata*]
 - 9: Ascospores (3–) 5 (–6)-septate *Phylloblastia blechnicola*
 - 8: Ascospores with 7 or more septa
 - 10: Ascospores 7-septate *Phylloblastia septemseptata*
 - 10: Ascospores (7–) 9–13 (–15)-septate
 - 11: Perithecia orange-brown; involucrellum absent; ascospores 4–6.5 μm wide, with mucronate apices *Phylloblastia mucronata*
 - 11: Perithecia medium to dark olive-brown; involucrellum present; ascospores 6–12 μm wide, non-mucronate *Phylloblastia excavata*

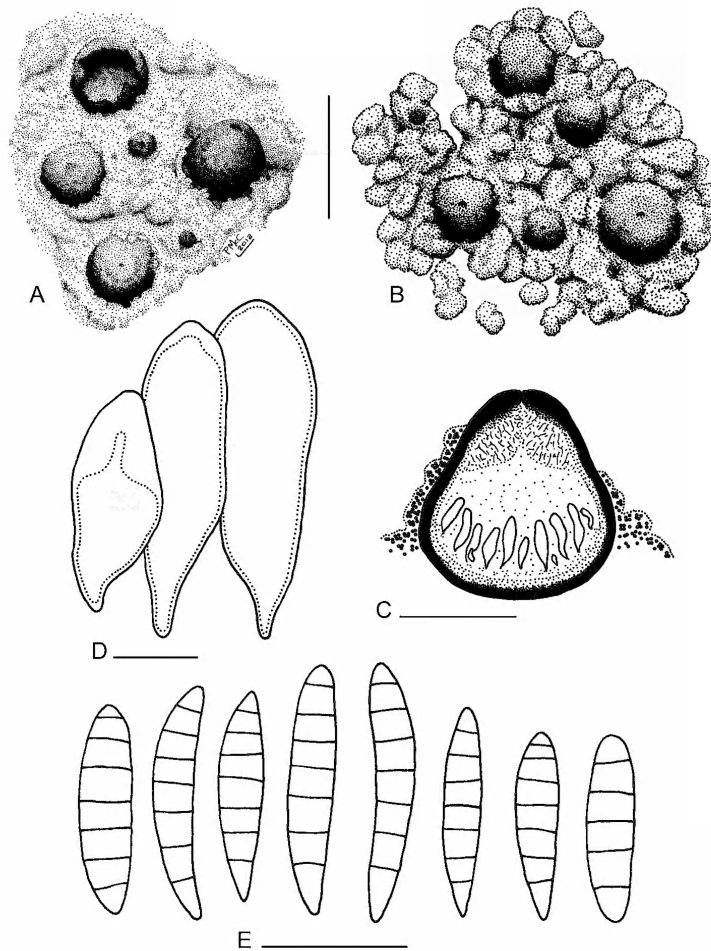


Fig. 1. *Psoroglaena halmaturina*. **A, B** habit of thalli and perithecia; **C** sectioned perithecium and adjacent thallus (semi-schematic); **D** (left to right) outline of immature, submature and mature asci; **E** mature ascospores. Scale bars: **A–B** 0.5 mm; **C** 0.2 mm; **D–E** 20 μ m. — **A, C–E** holotype; **B** *Kantvilas 487/12 & de Villiers*.

by its greenish, granulose to minutely squamulose corticolous thallus, dark, non-involucrellate perithecia that are eventually prominent (0.23–) 0.30 (–0.35) mm diam., and oblong-fusiform and predominantly 7-septate ascospores of $25\text{--}36 \times 5.5\text{--}9 \mu\text{m}$. The only other dark-fruited species of *Psoroglaena*, the leaf-inhabiting *P. laevigata* Lücking from Costa Rica, has discoid isidia, 0.15–0.25 mm diam. perithecia and 3–5-septate ascospores that are $20\text{--}28 \times 5\text{--}7 \mu\text{m}$ (Lücking 2008).

On the other hand, while *P. halmaturina* is superficially broadly similar to at least several of the 12 currently accepted species of *Agonimia*, its oblong-fusiform 7-septate ascospores distinguish it from the invariably ellipsoidal and muriform propagules of

Agonimia. Recent molecular analyses, or perhaps the species analysed (Muggia *et al.* 2010), have not resolved the relationship of *Psoroglaena* and *Agonimia*, nor do they address the complication of a possibly congeneric *Phylloblastia*. Clearly, as has been demonstrated for other pyrenocarpous lichen families such as the Pyrenulaceae (Harris 1973, 1995) and the Porinaceae (McCarthy & Malcolm 1997, as Trichotheliaceae), generic separation based solely or largely on ascospore septation (trans-septate vs muriform) is unsatisfactory. Indeed, if ascospore shape and septation are omitted from the generic diagnosis, then the Kangaroo Island lichen might just as easily be described as an *Agonimia*. However, given the current circumscriptions, that would be premature and certainly beyond the scope of this

contribution. Rather, *Psoroglaena* with its breadth of habitat and substratum preferences, as well as thalline and ascomatal morphology and anatomy is the most appropriate genus for what, regardless of its generic placement, is undoubtedly a hitherto undescribed species.

Distribution & habitat. *Psoroglaena halmaturina* is known only from two localities, both on Kangaroo Island, South Australia. Despite their relatively wide geographical separation (one is at the western extreme of the island, the other at the eastern), both sites fall within the 600 mm isohyet and can, therefore, be regarded as comparatively moist for the region as a whole.

At the type locality (Moffatt Road), *P. halmaturina* grew on thick, soft, fibrous bark at the base of a large eucalypt in a narrow, remnant band of mallee between a paddock and a road. Associated lichens included *Collema glaucophthalmum* var. *implicatum* (Nyl.) Degel., *Pannaria obscura* Müll.Arg. and an undescribed species of *Bacidia*. The depauperate condition of all the epiphytes suggested a heavily degraded habitat in severe decline. Its occurrence at the second locality (Ravine des Casoars) was equally tenuous. It grew on fibrous bark of young branches and twigs of *Melaleuca* in a narrow thicket 2–3 m tall fringing a creek. The habitat suggested a moist, sheltered environment, but incursion by a recent wildfire had destroyed all but a few ailing trees. Associated with the *Psoroglaena* were fragmentary thalli of *Pannaria obscura*, *Caloplaca kaernefeltii* S.Y.Kondr., Elix & A.Thell and *Rinodina australiensis* Müll.Arg. (all species typical of moist woodland), as well as *Opegrapha varia* Pers. *sens. lat.*, an undescribed species of *Amandinea* M.Choisy ex Scheid. & H.Mayrhofer, *Physcia adscendens* (Fr.) H.Olivier and *P. rolandii* Elix.

Etymology. Derived from *Halmaturus*, a generic name once applied to kangaroos, and commonly used as an epithet for species from Kangaroo Island.

Additional specimen examined

SOUTH AUSTRALIA. **Kangaroo Island:** Ravine des Casoars, along riverbank, c. 0.5 km inland from the coast, alt. 15 m, on bark of remnant living *Melaleuca* in a badly burnt, degraded strip of *Melaleuca*-dominated woodland, 24 Sep. 2012, G. Kantvilas 487/12 & B. de Villiers (HO 567251).

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